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PROGRESS REPORT  
NO. 1

Development of the ET-2 (Phase II) - Task 7, Pinto  
ERA Project 3027

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PERIOD: 1 August 1954 to 1 November 1954

OBJECTIVE

The aim of this task is the production of three improved models, design information, and complete manufacturing drawings and specifications for a miniaturized electromechanical transmitter known as the ET-2.

PROGRESS

In general, the efforts on this task have been along the lines outlined in the proposal: redesign of the tape stepping mechanism, redesign of the writing head, and subminiaturization of the electronic section. The design progress of the unit has been somewhat hindered by late delivery of parts for the tape stepping mechanism, such as the one-revolution clutch.

Tape Stepping Mechanism - The major redesign efforts have been directed toward the complete redesign of the tape stepping mechanism. The objectives of this redesign are to greatly decrease the noise level, to decrease the weight, to decrease the power requirement, and to increase the indexing precision. The present approach in effecting these improvements has been to employ a one revolution clutch in conjunction with the drive motor in lieu of a rotary solenoid as used in the engineering model of the ET-2. In this past month, a one revolution clutch was received and a rough mock-up of this system was made. Tests on this unit indicate that an appreciable decrease in noise level was realized. However, the noise level is still higher than is desired. Further work is to be done on this system to decrease this noise level. Estimates indicate that this system will weigh less than the original system, and will give improved indexing precision. Figure 1 shows diagrammatically the present tape stepping mechanism.

Electronic Circuitry - Redesign of the electronic circuitry brought about two major changes. The system now employs only subminiature tubes rather than octal and miniature tubes as in the engineering model of the ET-2. The greatest change is shown in the block diagram, Figure 2. In the old system, a class A amplification stage was employed before the phase splitting stage. In order to maintain the wave shape of the signal, special treatment had to be given to this stage. Because of its high signal level and low frequency requirements, it became a high impedance stage and was, therefore, susceptible to noise and distortion of the overshoot type. Similarly, in the old system the phase-splitting stage was a high signal level stage operating class A, and no d-c clamping could be effected; thus, it was more susceptible to undesirable distortion.

CONFIDENTIAL

Page 1 of 6

25X1

CONFIDENTIAL

Progress Report No. 1  
Development of the ET-2 (Phase II)

In the new system, the phase splitting is done in the modified cathode follower stage of the integrating amplifier at a relatively low signal level, as shown in Figure 2 (b). The following two stages are of the overdriven type in which clipping and d-c clamping are accomplished, thereby effecting the generation of a more uniform signal as well as improving the signal-to-noise ratio and eliminating undesirable distortion. In general, the changes indicated in the block diagram effect an increase in reliability.

Writing Head - Redesign of the writing head has been along two parallel paths.

The first was a minor redesign of the head as used in the engineering model. This redesign decreased the air gap of the writing yoke, thereby decreasing the signal width. Decrease in signal width lessened the low frequency requirements placed on the electronic circuitry and increased its reliability. A slight increase in signal level and signal-to-noise ratio was also realized.

The second approach to the writing head problem was a complete redesign of the head utilizing a different principle. In this new design, more tape area per band was magnetized, thereby giving an appreciable increase in signal level and signal-to-noise ratio. Figure 3 shows the basic differences of the two writing heads. At the present time, both types of heads are being fabricated. The reason for this duplication is that it is not known whether or not the completely redesigned head can be fabricated on a production basis. In the fabrication of this head, it is necessary to do a machine operation after the head has been annealed and it is not known whether or not the machining will spoil the anneal. If the anneal is not spoiled, this head will be used in the three units to be delivered.

Miscellaneous - The tape reading speed has been increased to give more reliable operation. This increased reliability is effected by the increase in signal level and the decrease in the required low frequency response.

An isolation type power transformer is being designed into the system to eliminate personnel hazards.

PLANS

To continue redesign of the unit as discussed in the above paragraphs.

25X1

CONFIDENTIAL

Page 2 of 6

CONFIDENTIAL

Progress Report No. 1  
Development of the ET-2 (Phase II)

PERSONNEL

The following engineering personnel are assigned to this project.



Project Supervisor

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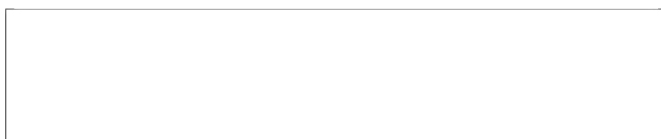
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Assistant Supervisor



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Page 3 of 6

25X1

DRIVE MOTOR

720 RPM

ONE REVOLUTION CLUTCH

360 RPM

TRIP MAGNET

90 RPM

TAPE PULLING CAPSTAN

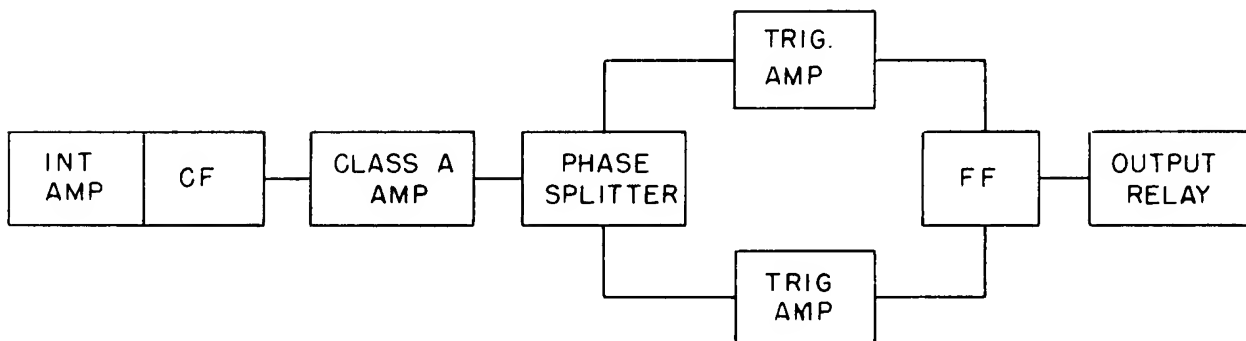
WHEN THE TRIP MAGNET IS ENERGIZED BY THE KEY ACTION THE CLUTCH IS RELEASED BY THE TRIP MAGNET FOR ONE REVOLUTION WHICH TURNS THE CAPSTAN FOR 1/4 TURN OR ONE CHARACTER TAPE LENGTH.

Page 4 25X1

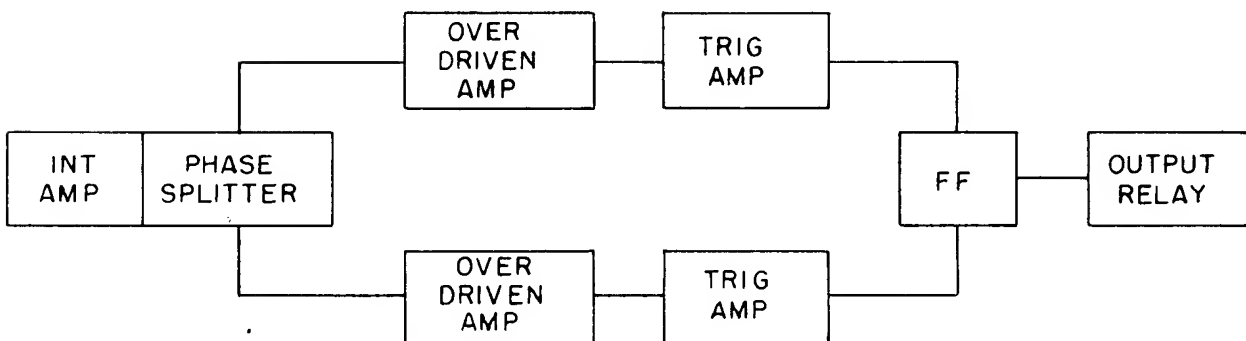
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**Progress Report No. 1  
Development of the ET-2 (Phase II)**



(a) OLD SYSTEM



(b) NEW SYSTEM

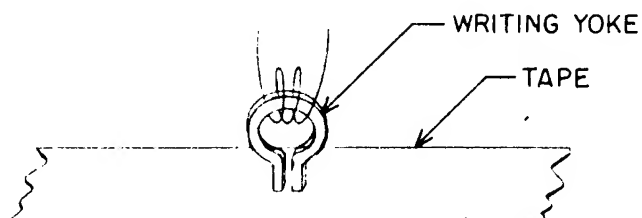
Figure 2. System Block Diagrams

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Page 5 of 25X1

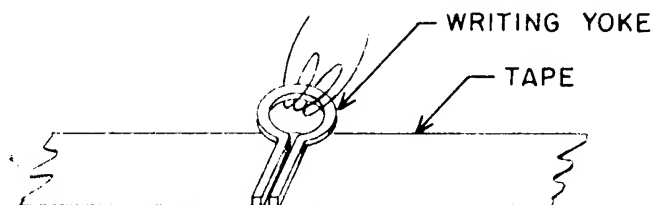
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Progress Report No. 1  
Development of the ET-2 (Phase II)



(a) OLD HEAD

NOTE: ONLY ONE OF SEVEN  
WRITING YOKES IS SHOWN.



(b) NEW HEAD

Figure 3. Writing Heads

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Page 6 of 6

25X1

PX 71802

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